

REMARKS/ARGUMENTS

Favorable reconsideration of this application, in view of the present amendment and in light of the following discussion, is respectfully requested.

Claims 1-22 and 24-58 are pending. Claims 9-17, 19-22, 24-29, 36-52, 55, 56, and 58 were withdrawn by the outstanding Office Action. In the present amendment, Claims 1, 7, 8, 18, 30-35, 53, 54, and 57 are currently amended and Claim 23 is canceled without prejudice or disclaimer. Support for the present amendment can be found in the original specification, for example, at page 22, line 25 to page 23, line 27, at page 72, line 9 to page 74, line 27 and in Figures 1-3 and 29A-30D. Thus, it is respectfully submitted that no new matter is added.

In the outstanding Office Action, Claims 1, 2, 8, 18, 23, and 54 were rejected under 35 U.S.C. § 102(a) as unpatentable over Schuppich et al. (U.S. Patent No. 7,247,276, hereinafter “Schuppich”); Claims 3, 4, and 5 were rejected under 35 U.S.C. § 103(a) as unpatentable over Schuppich in view of Thies et al. (U.S. Patent No. 6,736,983, hereinafter “Thies”); Claims 1-8, 18, 23, 30, 31, 33-35, 53, 54, and 57 were rejected under 35 U.S.C. § 103(a) as unpatentable over Kearl (U.S. Patent No. 6,828,055) in view of Bae et al. (U.S. Publication No. 2002/0169077, hereinafter “Bae”); Claim 32 was rejected under 35 U.S.C. § 103(a) as unpatentable over Kearl and Bae, and further in view of Lambert (U.S. Patent No. 5,139,648); and Claim 32 was rejected under 35 U.S.C. § 103(a) as unpatentable over Kearl and Bae, and further in view of Wang et al. (U.S. Publication No. 2003/00116503, hereinafter “Wang”).

The method claims of the present application are hereby amended, in part, to clarify that these claims should not be interpreted as step-plus-function claims under 35 U.S.C. § 112, sixth paragraph.

Regarding the rejections of Claim 23, it is noted that Claim 23 is hereby canceled without prejudice or disclaimer. Thus, it is respectfully submitted that these rejections are moot.

In response to the remaining rejections under 35 U.S.C. § 102(a) and 35 U.S.C. § 103(a), Applicants respectfully request reconsideration of these rejections and traverse these rejections, as discussed below.

Amended Claim 1 recites:

A microreactor for obtaining hydrogen gas by reforming a feed material, comprising:

a metal substrate having a microchannel portion on one surface thereof,

a heater provided on an other surface, where said microchannel portion is not formed, of said metal substrate via an insulating film,

a catalyst supported on said microchannel portion, and

a cover member having a feed material inlet and a gas outlet and joined to said metal substrate so as to cover said microchannel portion to form a single continuous flow path, wherein the feed material inlet and the gas outlet are substantially perpendicular to axial directions of the single continuous flow path.

Accordingly, the microreactor recited in amended Claim 1 includes a heater which is provided on an other surface of the metal substrate where the microchannel portion is not formed. Further, the cover member covers the microchannel to form a single continuous flow path in the microreactor. The cover member also includes a feed material inlet and a gas outlet that are substantially perpendicular to axial directions of a single continuous flow path. It is respectfully submitted that the cited references do not disclose or suggest every feature recited in amended Claim 1.

Schuppich describes microreactors connected in parallel that include a plurality of fluid guidance plates 1 having an open channel at a top and a bottom thereof.¹ Additionally, Schuppich describes that fluid enters the parallel fluid guidance plates 1 from above, and that the capillary grooves between the guide plates and force the fluid downward.² Additionally, Schuppich describes that the fluid guidance plates 1 can be cooled or heated from their rear side.³

However, it is respectfully submitted that Schuppich does not disclose or suggest “a cover member having a feed material inlet and a gas outlet and joined to said metal substrate so as to cover said microchannel portion to form a single continuous flow path, wherein the feed material inlet and the gas outlet are substantially perpendicular to axial directions of the single continuous flow path,” as recited in amended Claim 1.

Instead, as can be seen in Figure 2 of Schuppich, the fluid enters the plurality of parallel plates from above and exits from below in a *parallel* direction to the axis of the parallel plates, and thus the fluid does not enter or exit in a *perpendicular* direction. Additionally, the parallel plates form a plurality of capillary grooves that are not connected and not a *single continuous* flow path.

Accordingly, it is respectfully submitted that Schuppich does not disclose or suggest every feature recited in amended Claim 1. Thus, it is respectfully requested that the rejection of Claim 1, and all claims dependent thereon, as unpatentable over Schuppich be withdrawn.

Independent Claims 8, 18, and 54, although each is directed to an alternative embodiment, recite features similar to those discussed above with respect to Claim 1. Accordingly, it is respectfully submitted that Schuppich does not disclose or suggest every

¹ See Schuppich, at column 3, lines 1-13 and Figures 1-3.

² See Schuppich, at column 3, line 60 to column 4, line 8 and in Figure 2.

³ See Schuppich, at column 5, line 57 to column 6, line 10.

feature recited in independent Claims 8, 18, and 54. Thus, it is respectfully requested that the rejection of these claims as anticipated by Schuppich be withdrawn.

Regarding the rejection of Claims 3-5 as unpatentable over Schuppich in view of Thies, it is noted that Claims 3-5 depend on Claim 1 and thus are believed to be patentable for at least the reasons discussed above with respect to Claim 1. Further, it is respectfully submitted that Thies does not cure the above-noted deficiencies of Schuppich. Accordingly, it is respectfully submitted that Claims 3-5 patentably define over the combination of Thies and Schuppich. Thus, it is respectfully requested that the rejection of Claims 3-5 as unpatentable over Schuppich in view of Thies be withdrawn.

Kearl describes a fuel stack 22 including bipolar plates 10 and end plates 11 located at the extremities of the fuel cell stack 22.⁴ Additionally, Kearl describes that each bipolar plate 10 includes a first face 14 including at least one flow channel 36 and a second face 16 including at least one flow channel 38.⁵ Further, Kearl describes that unlike bipolar plates 10 that comprise flow channels on both faces of the plate, the end plates 11 comprise a substantially planar face 13 and a flow face 15 comprising flow channels.⁶ Kearl further describes that the fuel stack 22 includes an anode 30 and a cathode 32, which the Office Action equate to the claimed heater.

However, it is respectfully submitted that Kearl does not disclose or suggest “a heater provided on an other surface, where said microchannel portion is not formed, of said metal substrate via an insulating film,” as recited in amended Claim 1.

Instead, as discussed above, Kearl describes that only the end plates 11 include a flow channel on one face and no flow channel on the other face. Thus, the bipolar plate 10 cited by the Office Action is not the claimed metal substrate. Further, as can be seen in Figure 5,

⁴ See Kearl, at column 15, lines 41-50 and in Figures 2A and 2B.

⁵ See Kearl, at column 4, lines 62-67 and in Figure 1.

⁶ See Kearl, at column 15, lines 50-57.

Kearl describes that a plurality of flow channels are formed. However, in Figure 4, Kearl shows an alternative embodiment in which a single flow channel is formed. As can be seen in Figure 4, the inlet and outlet for the single flow channel are parallel, not perpendicular, to the axial direction of the flow channel.

Additionally, regarding the heater recited in amended Claim 1, Kearl describes that the anode 30 and the cathode 32 are sandwiched between bipolar plates 10, and thus are formed on a side of the bipolar plates 10 which includes the flow channels. Thus, the anode 30 and the cathode 32 are not on the substantially planar face 13 of the end plate 11.

Accordingly, it is respectfully submitted that Kearl does not disclose or suggest every feature recited in amended Claim 1. Additionally, it is respectfully submitted that Bae does not cure the above-noted deficiencies of Kearl. Thus, the combination of Kearl and Bae does not disclose or suggest every feature recited in amended Claim 1. Therefore, it is respectfully requested that the rejection of Claim 1, and all claims dependent thereon, as unpatentable over Kearl in view of Bae be withdrawn.

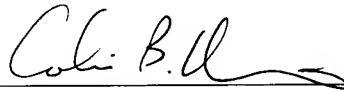
Independent Claims 7, 8, 18, 30, 53, 54, and 57, while directed to alternative embodiments, each recite features similar to those discussed above with respect to Claim 1. Accordingly, it is respectfully requested that the rejection of these claims, and all claims dependent thereon, as unpatentable over Kearl in view of Bae be withdrawn.

Regarding the rejections of Claim 32, it is noted that Claim 32 depends on Claim 30, and thus is believed to be patentable for at least the reasons discussed above with respect to Claim 30. Further, it is respectfully submitted that neither Lambert nor Wang cure the above-noted deficiencies of the combination of Kearl and Bae with respect to Claim 30. Thus, it is respectfully submitted that Claim 32 patentably defines over the cited combinations. Therefore, it is respectfully requested that the rejections of Claim 32 be withdrawn.

Consequently, in view of the present amendment, no further issues are believed to be outstanding in the present application and the present application is believed to be in condition for formal allowance. A Notice of Allowance is earnestly solicited.

Respectfully submitted,

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A handwritten signature in cursive script, appearing to read "Colin B. Harris", is written over a horizontal line.

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